Project Introduction

We have investigated the feasibility of employing a hazard detection and mitigation system based upon a polarization discriminating range-gated Lidar system. This dual use system will be capable of both imaging targets in low visibility scenarios, such as smoke, fog, haze, light rain, and low light levels, and providing an early warning of in-flight hazards, primarily icing conditions in clouds. The polarization discriminating optical system and accompanying image processing software are capable of differentiating highly depolarizing surfaces from those that contribute little to depolarization. Examples of this type of differentiation include water and ice phases in clouds and hard-target surfaces surrounded by an aerosol particulate media. The NIR Lidar system is designed to operate around 1.5 µm for maximum eye-safety, even when used from the ground. Major components of the Lidar unit include a laser transmitter, a fast gated detector, and polarization switching components. The performance of this type of system has been demonstrated in the Phase I project in laboratory experiments using custom built rain and fog generating chambers. Both image enhancement of a hard target and detection differing depolarization ratios were demonstrated. Backscattered noise from obscurants is greatly reduced by the fast-gated camera system, and a narrowband optical filter provides additional noise rejection. The NIR Lidar system can be easily integrated with a database of common object types for identification of hard targets, such as obstacles on a runway. Illuminated NIR imagery is ideal for providing images of hard targets, as object detail is very near that seen with a visible camera, unlike FLIR (forward-looking infrared) imagery, and the performance is equivalent in day or night conditions.

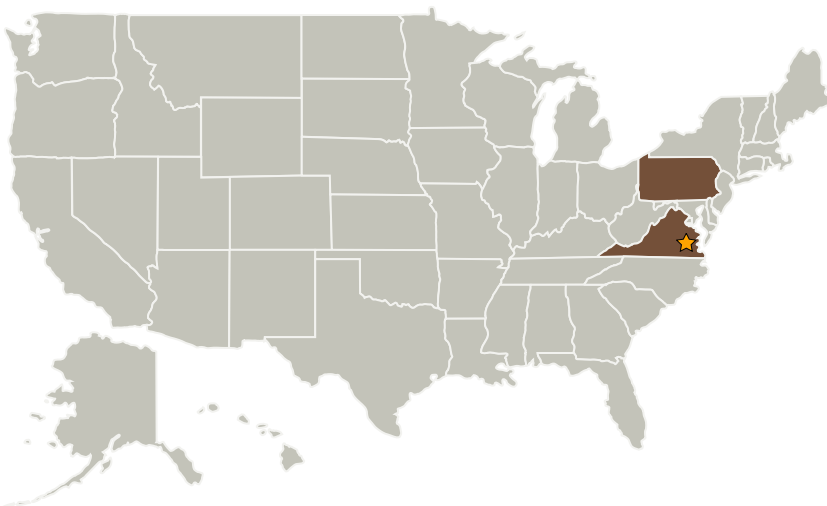## Primary U.S. Work Locations and Key Partners

NIR LIDAR for Hazard Mitigation, Phase II

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Organizations Performing Work	Role	Type	Location
⭐Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
RL Associates, Inc.	Supporting Organization	Industry	Chester, Pennsylvania

Primary U.S. Work Locations	
Pennsylvania	Virginia

Project Transitions

▶ **November 2007:** Project Start

✔ **November 2009:** Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  └ TX08.1 Remote Sensing Instruments/Sensors
    └ TX08.1.5 Lasers